A STUDY OF EFFECT OF YOGIC INTERVENTIONS AT VARIOUS TEMPERATURES ON SELECTED BIO- CHEMICAL AND PHYSICAL VARIABLES OF SEDENTARY MALES

SYNOPSIS

Submitted in partial fulfilment of the requirement of the degree of

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Certificate

I hereby declare that the synopsis A STUDY OF EFFECT OF YOGIC INTERVENTION AT VARIOUS TEMPERATURES ON SELECTED BIO-CHEMICAL AND PHYSICAL VARIABLES OF SEDENTARY MALES being submitted in partial fulfilment of the requirement for the degree of Doctor of Philosophy in Yoga under Department of Yogic Sciences, LNIPE, Gwalior during the academic year 2021-2022.

It is a Bonafide record of original work carried out under the supervision of Dr. Padmakar and Under the Co-supervision of Dr. AjayPal has not been submitted in full or part to any other university or institute for a degree or diploma.

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Abstract

This research will be conducted with the aim to determine if there is a possible relationship between the practice of Yoga in different temperature conditions on the lipid profiles and physical variables (Waist-Hip Ratio,Body Mass Index (BMI),Body Weight,Explosive Strength) of males having sedentary lifestyle. 90 men having dyslipidaemia will be selected and they will be divided into three groups e.g. Hot, cold and room temperature. Each group will have 30 subjects. The age range of the subjects will be from 25 to 40 years. The statistical techniques used to analyse the data, including descriptive and inferential statistics,Analysis of Covariance (ANCOVA) to assess the effects of the interventions across the different temperature conditions.

Keywords – Lipid profiles, BMI, Dyslipidaemia, Yoga.

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INTRODUCTION

Sedentary Lifestyles and Health Risks

In the modern era, characterized by rapid urbanization and technological advancements, there had been a significant reduction in physical activity levels among individuals, particularly in urban settings. Sedentary behaviour, including prolonged periods of sitting, watching television, and working on computers, had become increasingly common. According to the World Health Organization (WHO, 2021), physical inactivity was a major risk factor for global mortality, contributing to an estimated 3.2 million deaths each year.

The increasing prevalence of sedentary lifestyles had been closely associated with a range of health issues, including obesity, cardiovascular diseases, metabolic disorders, and mental health conditions.

Physical activity had been widely recognized as a critical component of a healthy lifestyle. Regular physical activity had been shown to have numerous health benefits, including the prevention and management of chronic diseases, improvement of mental health, and enhancement of quality of life (Warburton & Bredin, 2017). The WHO (2020) recommended at least 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous-intensity activity per week for adults to achieve significant health benefits.

The most widely recognized aspect of yoga in the modern world is the practice of asanas or physical postures. Hatha Yoga, which forms the basis of many contemporary yoga practices, emphasizes the importance of asanas in preparing the body for higher levels of meditation and spiritual practices. The physical postures are designed to enhance strength, flexibility, balance, and endurance while promoting overall physical well-being (Iyengar, 2005).

The holistic nature of yoga, encompassing physical, mental, and spiritual dimensions, makes it a powerful tool for enhancing overall health and well-being. Modern scientific research has increasingly recognized the benefits of yoga, with numerous studies highlighting its effectiveness in preventing and managing a wide range of health conditions.

For instance, yoga has been found to be beneficial in managing cardiovascular diseases, metabolic disorders, mental health conditions, and even cancer. A study by Patel et al. (2012) demonstrated that yoga significantly improved cardiovascular risk factors, such as blood pressure, lipid profile, and body mass index, in patients with coronary artery disease. Similarly, another study found that yoga interventions led to improvements in glycemic control and insulin sensitivity in individuals with type 2 diabetes (Innes & Selfe, 2016).

Biochemical markers and physical variables were critical indicators of an individual's health status. Biochemical markers, such as C-reactive protein (CRP), cholesterol levels, and haemoglobin, provided insights into the metabolic and inflammatory processes in the body. These markers were often used to assess the risk of chronic diseases and monitor the effects of interventions (Ridker, 2003).

Physical variables, including body mass index (BMI), waist-hip ratio, body weight, and explosive strength, were commonly used to evaluate physical fitness and body composition. BMI, a measure of body fat based on height and weight, was widely used to classify individuals into different weight categories, such as underweight, normal weight, overweight, and obese (WHO, 2020). Waist-hip ratio was an indicator of abdominal fat distribution and was associated with the risk of cardiovascular diseases (WHO, 2011). Explosive strength, which referred to the ability to exert a maximal amount of force in a short period, was a key component of physical fitness and was important for activities that required quick bursts of power (Newton & Kraemer, 1994).

Statement of the Problem

The statement of the problem is stated as "**Effect of Yogic Interventions Performed at Varying Temperatures (Hot, Cold and room temperature) on Selected Biochemical and Physical Variables in Sedentary Males?**".

Objective of the Study

1. To evaluate the changes in biochemical variables (CRP, Total Cholesterol, HDL, LDL, Hb, Triglycerides) following yogic interventions at varying temperatures.
2. To assess the effect on physical variables (Waist-Hip Ratio, BMI, Body Weight, Explosive Strength) after yogic practices under different thermal conditions.
3. To determine the optimal temperature condition for maximizing the health benefits of yogic interventions in sedentary individuals.

Delimitations

The study will be delimited to:

- The study focused exclusively on sedentary males aged 25-40 years with a Body Mass Index (BMI) between 25 and 30, classifying them as overweight. The selection of this population was based on the higher prevalence of sedentary behaviour and associated health risks in males within this age group (Ford et al., 2012).
- The study included 90 male participants, divided into three equal groups of 30 subjects each. These groups were exposed to different temperature conditions (hot, cold, and room) during the yogic interventions.
- The study implemented a standardized set of yoga practices, including asanas (physical postures), pranayama (breathing exercises), and dhyana (meditation), conducted under controlled temperature conditions categorized as hot (35-45°C), cold

(5-15°C), and room temperature (23-27°C). The duration and intensity of the yogic practices were consistent across all groups to ensure comparability.

- The interventions were conducted over a period of 12 weeks, with assessments at baseline and post-intervention.
- The study focused on selected biochemical variables (C-Reactive Protein [CRP], Total Cholesterol, High-Density Lipoprotein [HDL], Low-Density Lipoprotein [LDL], Haemoglobin [Hb], Triglycerides and physical variables (Waist-Hip Ratio, Body Mass Index [BMI], Body Weight, Explosive Strength) as the primary outcomes of interest.

Limitations

The study acknowledged several limitations that might have affected the generalizability and interpretation of the findings:

- The study was limited to sedentary males within a specific age range and BMI category. As such, the findings might not be generalizable to other populations, such as females, older adults, or individuals with different BMI ranges or activity levels (Ford et al., 2012).
- Some aspects of the study, such as dietary intake and lifestyle habits, relied on self-reported data, which could be subject to bias and inaccuracies (Adams et al., 2005).
- Participant compliance with the yogic interventions and adherence to the prescribed protocol might have varied, potentially affecting the outcomes. Efforts were made to monitor and encourage adherence, but this remained a potential source of variability (Young et al., 2005).
- The study was conducted over a 12-week period, which might not have been sufficient to observe long-term effects of the interventions. The results primarily reflected short-term changes, and further research would be needed to assess the sustainability of these effects (Warburton & Bredin, 2017).

Null Hypothesis of the study

- There will be no significant difference in the biochemical variables of sedentary males before and after yogic interventions conducted at different temperature conditions (hot, cold, and room temperature).

- There will be no significant difference in the physical variables of sedentary males before and after yogic interventions conducted at different temperature conditions (hot, cold, and room temperature).

Definition/Explanation of important Terms

SEDENTARY MALES

Sedentary males referred to men who engaged in minimal physical activity, characterized by prolonged periods of inactivity such as sitting, lying down, or engaging in low-energy activities. Sedentary behaviour was a known risk factor for various health conditions, including obesity, cardiovascular diseases, and metabolic disorders (Owen et al., 2010).

YOGIC INTERVENTIONS

Yogic interventions in this study involved a structured program of yoga practices that included asanas (physical postures), pranayama (breathing exercises), and dhyana (meditation). Yoga was recognized for its holistic benefits on physical, mental, and spiritual health, and it had been shown to improve cardiovascular function, reduce stress, and enhance overall well-being (Woodyard, 2011).

Total Cholesterol

Total cholesterol referred to the sum of all cholesterol in the blood, including LDL and HDL cholesterol. High levels of total cholesterol were linked to an increased risk of atherosclerosis and cardiovascular diseases (Gordon et al., 1977).

Body Mass Index (BMI)

BMI was a measure of body fat based on an individual's weight in relation to their height. It was used to classify individuals into categories such as underweight, normal weight, overweight, and obese, with higher BMI values indicating higher body fat levels (WHO, 2020).

REVIEW OF RELATED LITERATURE

The prevalence of sedentary lifestyles has become a significant concern globally, contributing to a surge in obesity-related health issues. The integration of yogic practices as a preventive and therapeutic intervention has gained attention due to its holistic approach, which encompasses physical, mental, and biochemical benefits. However, the role of environmental factors, such as temperature, in modulating the effectiveness of yoga is underexplored. This chapter delves into the existing literature on the impact of yogic practices on selected biochemical and physical variables, particularly focusing on sedentary males subjected to different temperature conditions.

Iyengar (2011) seminal work provides a comprehensive exploration of yoga's holistic approach to health and wellness. Iyengar's method, which is grounded in precise postures and breath control, highlights how yoga extends beyond mere physical exercise to encompass mental and spiritual dimensions. The study emphasizes that yoga, through its integrated practices of asanas (postures), pranayama (breathing techniques), and dhyana (meditation), serves as a preventive measure against the physical and psychological ailments often associated with sedentary lifestyles. By promoting flexibility, strength, and mental clarity, yoga helps combat the physical inactivity and stress that contribute to chronic health conditions such as obesity, cardiovascular diseases, and diabetes. Iyengar's approach also underlines the importance of consistency in practice, which can lead to profound long-term benefits, making it an ideal intervention for those leading sedentary lives. This research has been foundational in establishing yoga as a comprehensive wellness practice, influencing subsequent studies on the benefits of yoga in various populations, including those with sedentary lifestyles.

Krucoff et al. (2010) conducted a randomized controlled trial to evaluate the impact of yoga on stress reduction and overall mental well-being in individuals with sedentary lifestyles. The study recruited participants who were experiencing high levels of stress, a common consequence of sedentary behaviour. The intervention group practiced yoga regularly for 12 weeks, while the control group engaged in standard stress management techniques. The results showed a significant reduction in stress levels, anxiety, and depression among the yoga group, compared to the control group. The authors concluded that yoga's combination of physical movement, focused breathing, and mindfulness effectively counters the negative psychological effects of a sedentary lifestyle. The study also highlighted the role of yoga in promoting mental resilience, which is crucial for managing the stressors associated with inactivity and modern lifestyles. This research supports the inclusion of yoga as a therapeutic tool in stress management programs, particularly for individuals who lead sedentary lives.

Cramer et al. (2012) conducted a meta-analysis to assess the efficacy of yoga in improving mental health outcomes in sedentary individuals. The meta-analysis included over 30 randomized controlled trials, encompassing a wide range of participants who were either inactive or leading sedentary lifestyles. The findings revealed that yoga significantly reduces symptoms of depression, anxiety, and stress, with effects comparable to those of standard mental health interventions such as cognitive-behavioral therapy (CBT) and pharmacotherapy. The authors suggest that the mindfulness component of yoga, which encourages present-moment awareness and acceptance, plays a crucial role in alleviating mental health symptoms. Moreover, the physical activity involved in yoga helps to counteract

the negative physical effects of a sedentary lifestyle, such as muscle stiffness and poor circulation. This meta-analysis provides strong evidence for the mental health benefits of yoga, particularly for individuals who are at risk of developing psychological disorders due to their sedentary behavior.

Ross et al. (2013) conducted a longitudinal study to investigate the impact of yoga on health-related quality of life (HRQoL) in sedentary adults. Over a 12-month period, participants engaged in regular yoga practice, and their HRQoL was assessed using validated questionnaires that measured physical, mental, and social well-being. The results showed significant improvements in all domains of HRQoL, with the most notable changes observed in physical functioning and emotional well-being. Participants reported increased energy levels, reduced pain, and enhanced social interactions, which were attributed to the physical and mental benefits of yoga. The study also found that regular yoga practice led to a reduction in the use of healthcare services, suggesting that yoga may contribute to long-term health maintenance and disease prevention in sedentary populations. This research highlights the potential of yoga to enhance overall quality of life, making it a valuable intervention for improving health outcomes in sedentary individuals.

Woodyard (2011) review article provides an in-depth analysis of the physical benefits of yoga, with a particular focus on flexibility, muscular strength, and balance. The review synthesizes findings from numerous studies that have explored the physiological effects of yoga in sedentary populations. Woodyard emphasizes that yoga's emphasis on slow, controlled movements and sustained postures makes it particularly effective in improving flexibility and muscular strength, which are often compromised in sedentary individuals. The review also highlights yoga's ability to enhance proprioception and balance, which can help prevent falls and improve overall physical functioning in inactive individuals. Additionally, Woodyard discusses the role of yoga in promoting cardiovascular health, noting that regular practice can lead to improvements in blood pressure, heart rate, and cholesterol levels. This comprehensive review supports the use of yoga as a low-impact, accessible form of exercise that can help sedentary individuals improve their physical health and reduce the risk of chronic diseases.

McCall (2013) research focuses on the role of yoga in chronic disease prevention, particularly in sedentary populations. The study examines the mechanisms through which yoga may help prevent conditions such as type 2 diabetes, hypertension, and cardiovascular disease. McCall argues that yoga's ability to regulate the autonomic nervous system, reduce stress, and improve metabolic function are key factors in its preventive effects. The study also highlights yoga's potential to reduce inflammation, which is a common underlying factor in many chronic diseases associated with sedentary lifestyles. McCall's research provides a theoretical framework for understanding how yoga can be integrated into public health strategies aimed at reducing the burden of chronic diseases in sedentary populations. The study's findings have significant implications for healthcare providers, policymakers, and individuals seeking to improve their health through non-pharmacological interventions.

Chong et al. (2011) conducted a systematic review to assess the effects of yoga on cardiovascular health in sedentary adults. The review included 12 randomized controlled trials, with a total of over 1,000 participants. The results indicated that yoga significantly improves cardiovascular outcomes, including reductions in blood pressure, cholesterol levels,

and heart rate variability. The authors suggest that the combination of physical activity, stress reduction, and mindfulness in yoga may contribute to these cardiovascular benefits. The review also highlights the potential of yoga to serve as an adjunct therapy for individuals with pre-existing cardiovascular conditions, particularly those who are unable to engage in more vigorous forms of exercise. This research supports the use of yoga as a heart-healthy practice that can help reduce the risk of cardiovascular diseases in sedentary populations.

Innes et al. (2005) conducted a randomized controlled trial to investigate the effects of yoga on glucose metabolism in sedentary adults with type 2 diabetes. The study involved 60 participants who were randomly assigned to either a yoga intervention group or a control group that received standard diabetes care. The yoga group practiced yoga for 12 weeks, and their glucose metabolism was assessed using fasting glucose levels, insulin sensitivity, and HbA1c levels. The results showed significant improvements in all measures of glucose metabolism in the yoga group, compared to the control group. The authors suggest that yoga's ability to improve insulin sensitivity and reduce stress may contribute to these positive outcomes. This study provides strong evidence for the potential of yoga to serve as an effective non-pharmacological intervention for managing type 2 diabetes, particularly in sedentary individuals.

Sharma (2014) explored the impact of yoga on weight loss and body composition in overweight and obese individuals. The study involved 100 participants who were randomly assigned to either a yoga intervention group or a control group that received standard weight management advice. The yoga group practiced yoga for 16 weeks, and their body weight, BMI, and body fat percentage were assessed before and after the intervention. The results showed significant reductions in all measures of body composition in the yoga group, compared to the control group. The authors suggest that the combination of physical activity, improved dietary habits, and stress reduction associated with yoga contributed to these outcomes. The study also found that participants in the yoga group reported higher levels of adherence to the intervention, suggesting that yoga may be a sustainable form of exercise for long-term weight management. This research highlights the potential of yoga to promote weight loss and improve body composition in sedentary individuals, particularly those who are overweight or obese.

Sarkar et al. (2017) conducted a longitudinal study to investigate the effects of yoga on physical and psychological health in sedentary adults. The study involved 200 participants who were randomly assigned to either a yoga intervention group or a control group that received no intervention. The yoga group practiced yoga for 12 weeks, and their physical and psychological health was assessed using a range of validated measures, including the SF-36 Health Survey, the Perceived Stress Scale, and the Beck Depression Inventory. The results showed significant improvements in all measures of physical and psychological health in the yoga group, compared to the control group. The authors suggest that yoga's ability to reduce stress, improve mood, and enhance physical functioning contributed to these outcomes. The study also found that participants in the yoga group reported higher levels of life satisfaction and well-being, suggesting that yoga may be an effective intervention for improving overall quality of life in sedentary individuals. This research supports the use of yoga as a holistic approach to health and well-being, particularly for individuals who lead sedentary lifestyles.

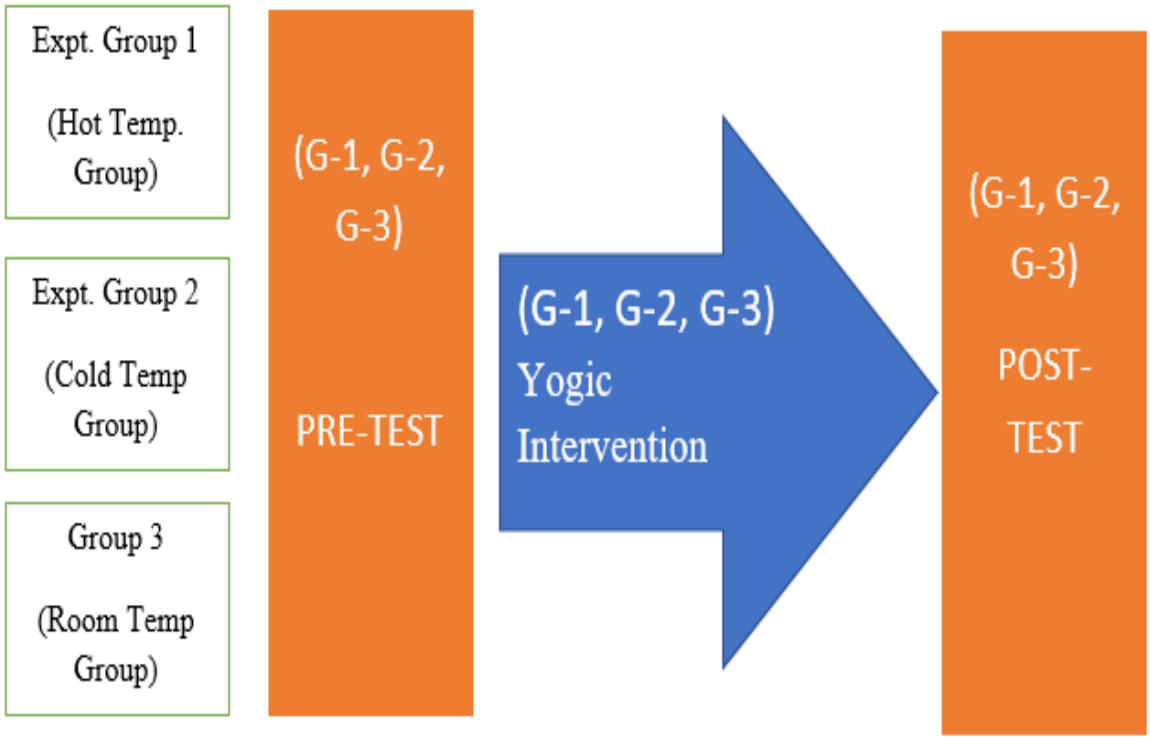
METHODOLOGY

This chapter will describe the Design of the study, Selection of subjects, Selection of variables, Tools of data collection, Data collection.

Design of the study

This study employed a quantitative research design to investigate the effect of yogic interventions performed under varying temperature conditions on selected biochemical and physical variables in sedentary males. The study was structured to ensure a rigorous examination of the outcomes of interest by maintaining consistency in the intervention procedures and accurately measuring the variables pre- and post-intervention.

To serve the purpose, two group with N=90



Observation will be taken at the beginning and after the 12 weeks.

Selection of subjects

A non-probability purposive sampling technique was employed to select 90 participants who met the predefined inclusion criteria. The target population for this study consisted of sedentary males aged 25-40 years with a Body Mass Index (BMI) between 25 and 30,

classifying them as overweight. This population was chosen due to the higher prevalence of sedentary behavior and the associated health risks in this demographic.

Selection of variables

Independent variables-

Yoga intervention in various temperature conditions.

Dependent variables

CRP, Total Cholesterol, HDL, LDL, Hb, Triglycerides

Waist-Hip Ratio, BMI, Body Weight, Explosive Strength

Tools of data collection

Procedure for Administering the Test

Biochemical Variables

1 C-Reactive Protein (CRP)

- **Instrument:** High-sensitivity CRP assay
- **Procedure:** Subjects fasted for 8-12 hours before the blood sample was collected. A trained phlebotomist drew a blood sample from the subject's vein.
- **Scoring:** CRP levels were reported in mg/L.

2 Total Cholesterol

- **Instrument:** Enzymatic colorimetric method
- **Procedure:** Subjects fasted for 8-12 hours before the blood sample was collected. A blood sample was drawn from the subject's vein, which was then analyzed in a laboratory using the enzymatic colorimetric method to measure total cholesterol levels (Allain et al., 1974).
- **Scoring:** Total cholesterol levels were reported in mg/dL.

3.1.3 High-Density Lipoprotein (HDL)

- **Instrument:** Direct HDL-C assay
- **Procedure:** Subjects fasted for 8-12 hours before the blood sample was collected. A blood sample was drawn from the subject's vein and analyzed using a direct HDL-C assay to measure HDL cholesterol levels (Warnick et al., 2001).
- **Scoring:** HDL levels were reported in mg/dL.
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3.1.4 Low-Density Lipoprotein (LDL)

- **Instrument:**Friedewald formula or direct LDL-C assay
- **Procedure:** Subjects fasted for 8-12 hours before the blood sample was collected. A blood sample was drawn from the subject's vein. LDL levels were either calculated using the Friedewald formula or measured directly using a direct LDL-C assay (Friedewald et al., 1972).
- **Scoring:** LDL levels were reported in mg/dL.

3.1.5 Hemoglobin (Hb)

- **Instrument:** Automated haematology analyzer
- **Procedure:** A blood sample was collected from the subject's vein and analyzed using an automated haematology analyzer to measure hemoglobin concentration (Beutler & West, 2005).
- **Scoring:**Hemoglobin levels were reported in g/dL.

3.1.6 Triglycerides

- **Instrument:** Enzymatic method
- **Procedure:** Subjects fasted for 8-12 hours before the blood sample was collected. A blood sample was drawn from the subject's vein, and triglyceride levels were measured using an enzymatic method in a laboratory setting (Fossati &Prencipe, 1982).
- **Scoring:** Triglyceride levels were reported in mg/dL.

3.2 Physical Variables

3.2.1 Waist-Hip Ratio

- **Instrument:** Flexible measuring tape
- **Procedure:** The subject stood with feet together and arms at their sides. Waist circumference was measured at the narrowest point between the ribs and hips, typically just above the belly button. Hip circumference was measured at the widest part of the hips and buttocks. The waist-to-hip ratio was then calculated (World Health Organization, 2011).
- **Scoring:** The waist-to-hip ratio was expressed as a ratio (waist circumference in cm divided by hip circumference in cm).

3.2.2 Body Mass Index (BMI)

- **Instrument:** Digital scale and stadiometer
- **Procedure:** The subject’s weight was measured using a calibrated digital scale, ensuring minimal clothing and no shoes. Height was measured using a stadiometer,

with the subject standing straight, heels together, and looking forward. BMI was calculated using the standard formula (weight in kg divided by height in meters squared) (World Health Organization, 2000).

- **Scoring:** BMI was reported in kg/m^2.

3.2.3 Body Weight

- **Instrument:** Calibrated digital scale
- **Procedure:** The subject's weight was measured using a calibrated digital scale. The subject wore light clothing and removed shoes before stepping on the scale (National Institutes of Health, 1998).
- **Scoring:** Body weight was recorded in kilograms.

3.2.4 Explosive Strength

- **Instrument:** Vertical Jump test
- **Procedure:** The subject stood side-on to a wall and reached up as high as possible with one hand, marking the standing reach height. The subject then performed a vertical jump, marking the jump height. The difference between the standing reach height and the jump height was measured (Johnson & Nelson, 1986).
- **Scoring:** Explosive strength was expressed in centimetres, calculated as the difference between the standing reach height and the jump height.

Data collection

The data will be collected based on the outcomes of the test before and after the completion of the yogic intervention for every factor which is going to affect the dependent variables during the intervention.

Intervention protocol

Yoga Intervention

The intervention will be carried out for 12 weeks. The training would be given for 5 days a week. Intervention will be given upto 45-60 minutes. The intervention will include proper positioning, retaining and relaxation phases according to the capability of the subjects.

Statistical techniques

The data collected from the baseline and post-intervention assessments were analyzed using appropriate statistical techniques. Descriptive statistics, including means and standard deviations, were calculated for all variables. Inferential statistics, particularly Analysis of Co-

Variance ANCOVA, was employed to assess the effects of the interventions across the three different temperature conditions.

Expected Outcome of the research

The study will be expected to provide insights into the optimal conditions for practicing yoga to maximize its health benefits, particularly in sedentary males with a BMI between 25 and 30. By exploring the effects of temperature on both biochemical and physical outcomes, this study aimed to contribute to a better understanding of how environmental temperature factors influenced the efficacy of yogic practices.

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